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WHAT IS CLAIMED IS:

1. A recombinant vector for transforming a strain to detect benzoic acid and derivatives, comprising:

a bioluminescent gene encoding a bioluminescent protein; and

a gene set inducing the expression of the bioluminescent gene,

wherein the gene set includes regulatory gene nagR and a promoter region inducing the transcription of the bioluminescent gene via the action of protein NagR encoded by the gene nagR.

2. The recombinant vector according to claim 1, wherein the promoter region inducing the transcription of the bioluminescent gene is a promoter region of the nag operon.

3. The recombinant vector according to claim 1 or 2, wherein the bioluminescent gene is luxCDABE gene.

4. The recombinant vector according to claim 1, wherein the recombinant plasmid has a cleavage map shown in Fig. 1, and is pNAG1 for transforming *E. coli* to detect benzoic acid and derivatives.

5. The recombinant vector according to claim 4, wherein the *E. coli* is *E. coli* RFM 443.

6. Transformant EBNAG1 (KACC 91044) produced by transforming *E. coli* with the recombinant vector according to claim 4.

7. A method for detecting benzoic acid and derivatives thereof by measuring bioluminescence generated after reacting the transformant according to claim 6 with a sample to be tested.